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(54) A guide for a cutting tool

(57) A guide for a cutting tool such as a router, has a guide body 12 with an opening 16 for receiving a fixed part 17 of the cutting tool in a manner such as to allow relative rotation between the cutting tool and the guide body 12, and a pin 21 for engaging a workpiece and defining a centre about which the guide body 12 can turn whereby to carry the tool in a circular path. The pin 21 is carried by a subsidiary slide (20, Fig. 2) slidable in a main slide 18 slidable in the guide body 12. An abutment member 30 engageable with the cutter is used to set the main slide 18 relative to the guide body 12. The main slide 18 carries a graduated scale.

The guide may incorporate an epicentric datum device to permit epicyclic or hypocyclic curves to be cut.

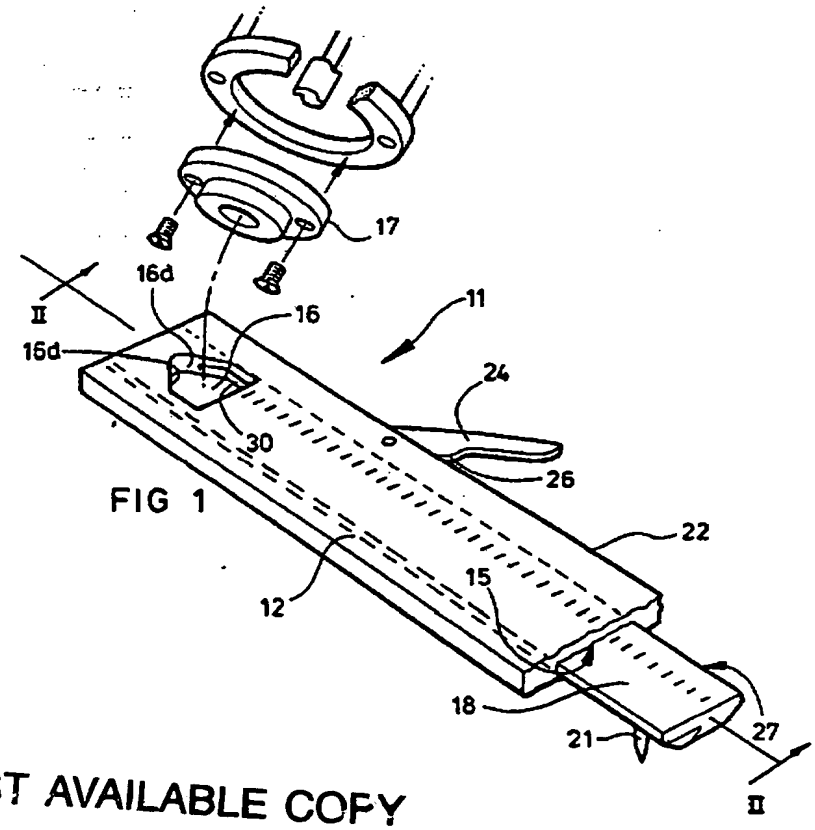

FIG 1

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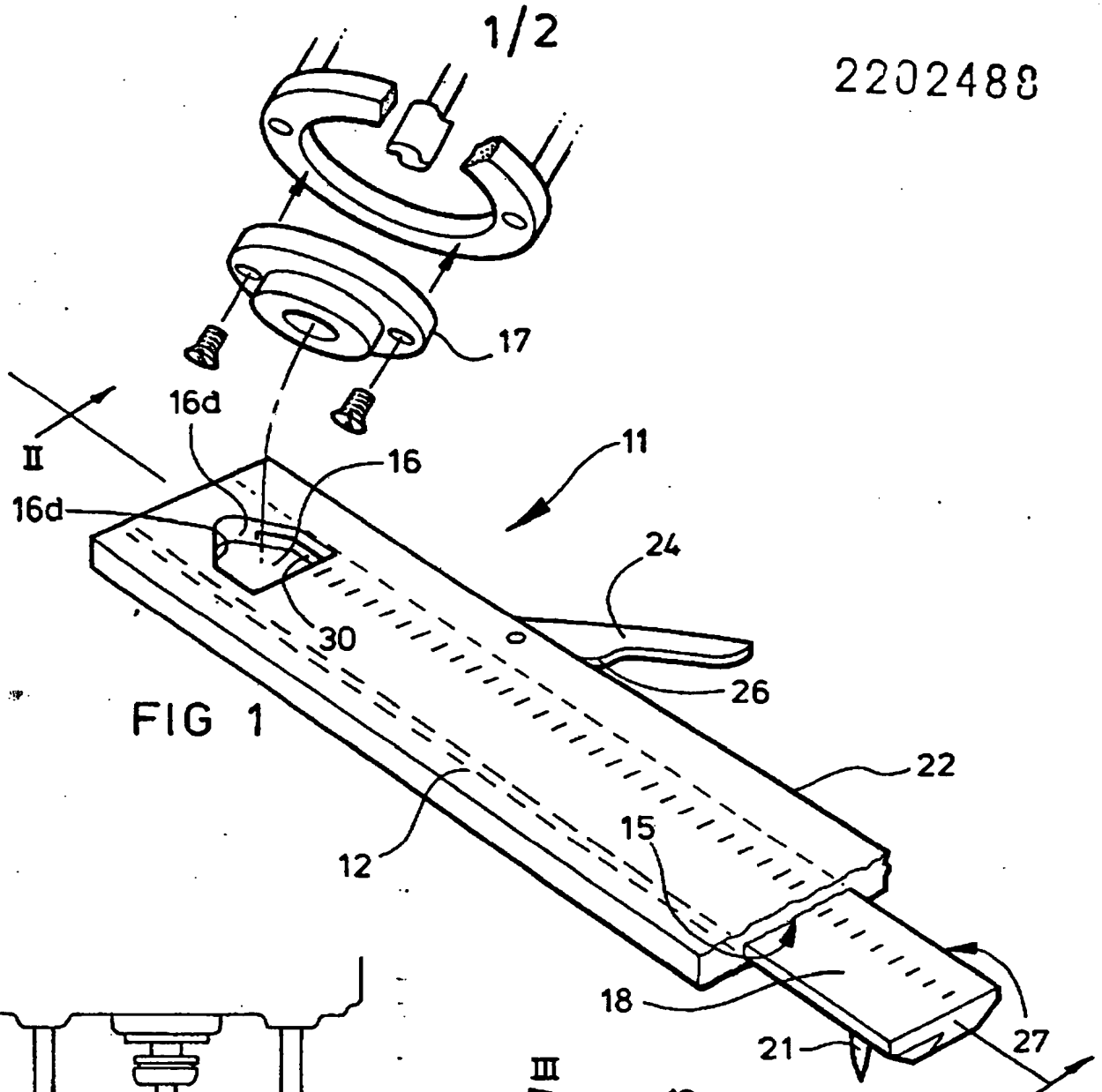

FIG 1

FIG 2

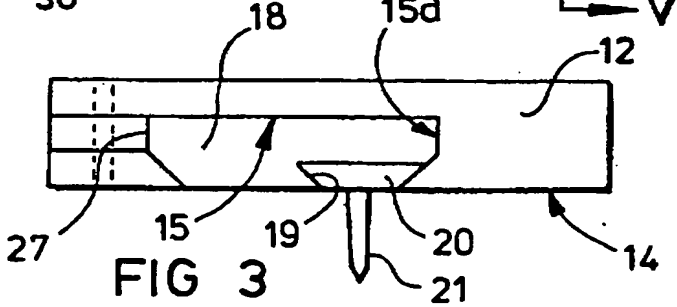

FIG 3

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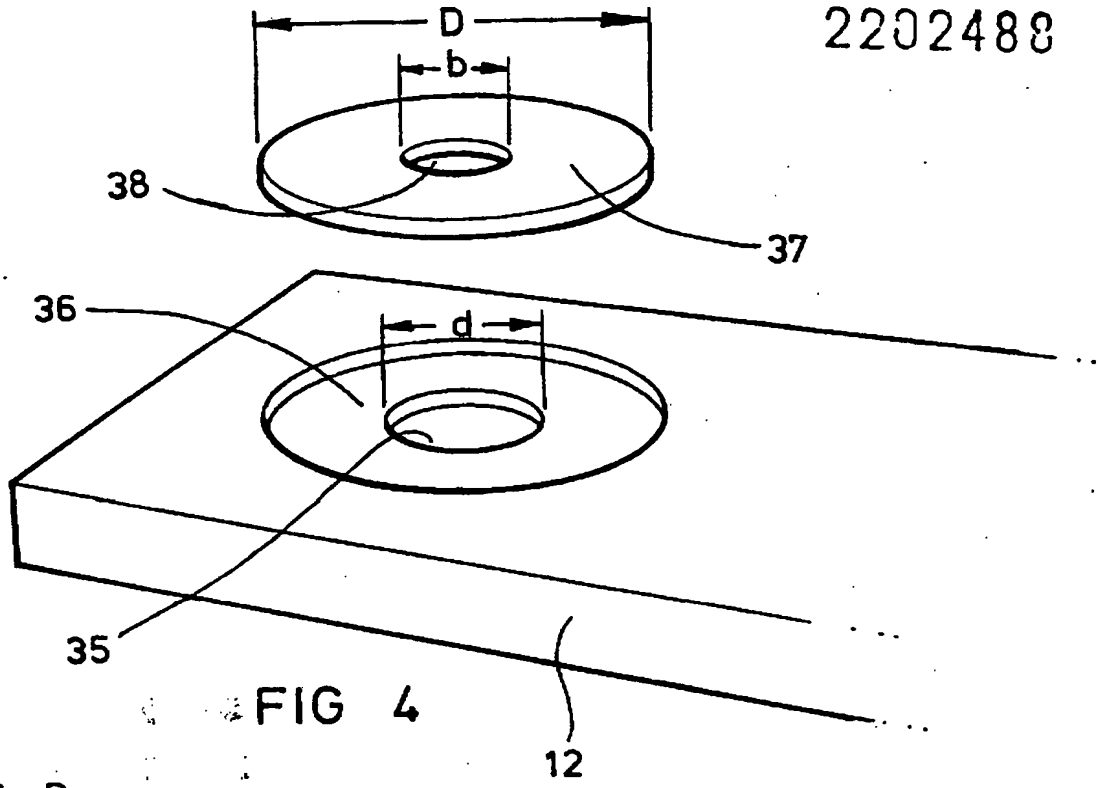

FIG 4

b<d<D

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A GUIDE FOR A CUTTING TOOL

The present invention relates generally to a guide for a cutting tool, and particularly to a guide suitable for use with a router or other like spindle-type cutting tool specifically adapted to cut circular or circular-based shapes.

One of the problems currently encountered when using plunge-routers is the fact that, although it is possible to use guides or templates with the routers, it is very difficult to obtain circular shapes because the only available attachments, known as trammel bars, involve the necessity of turning the tool bodily as it passes around the circle and, since the operator is usually constrained to remain on one side of the workpiece, this either means changing hands on the two opposite handles of the router, or considerable discomfort and inconvenience in moving the router around the complete circle.

Further, since plunge-routers operate with sharp cutting bits turning at very high speed there is a not inconsiderable risk of danger or injury when using trammel bars because of the possibility that the router may become displaced from the restraint offered thereby when the operator is changing hands on the control handles.

The present invention seeks, therefore, to provide a guide usable with a cutting tool such as a router or the like with which it will be possible to cut circles or circular shapes (namely hypocyclic or epicyclic shapes) without changing the orientation of the router with

respect to the operator.

According to the present invention, therefore, a guide for a cutting tool such as a router or the like comprises a guide body having means for receiving a fixed part of the cutting tool in a manner such as to allow a relative rotation between the tool and the guide body, and engagement means for engaging a workpiece to allow the guide body to turn thereabout carrying the tool in a path centred on the point of engagement between the guide body and the workpiece.

Preferably the guide body has an opening for receiving a guide bush of a router (means being provided for locating the guide bush in a fixed position with respect to the guide body engagement means) whereby to allow the router to turn about an axis centred on the cutter spindle with respect to the guide body whilst being located in a fixed position with respect to the guide body engagement means.

The guide body may be transparent and there are provided means for adjusting the relative separation of the said workpiece engagement means and the toolreceiving means. This allows the radius of a circle or circular component cut by the router to be adjusted easily.

The means for adjusting the relative separation preferably comprise a channel in the said guide tool body, a slide member displaceable along the channel and means for fixing the slide member in a selected position along the channel. This channel may be rectilinear or curvilinear, and the said means for fixing the slide

member is preferably clamping means effective to clamp the movable parts of the guide together in the selected relative position.

In the preferred embodiment of the invention the slide member has a plurality of graduated markings thereon and means for determining a reference datum which can be brought into a predetermined position with respect to a cutter of a tool housed in the opening in the guide body. This is necessary in order to ensure that the guide can be used with a range of different tools bearing in mind that the guide bushes and cutters of a router may differ from tool to tool so that variations in the cutter-to-centre distance may be introduced upon changing such cutters. It is also important to realise that the circular shapes cut by use of the guide of the present invention may be internal or external, that is, the guides may be used to cut a circular hole in a body or to cut a circular body, in which case the operative edge of the cutting tool will be different, namely the radially outer edge in the case of a hole and the radially inner edge in the case of a circular body to be cut from the workpiece. The graduated markings can therefore always be read directly, once the appropriate reference datum has been brought into the predetermined position with respect to the cutter, so that no separate allowance need be made after reading the scale.

The reference datum may be constituted, for example, by an abutment member displaceable between an operative position where it can be brought into contact with the cutter of the said tool, and an inoperative position out of the line of movement of the cutting tool.

Preferably the means for engaging a workpiece is carried on a displaceable member which can be moved with respect to the said slide member and locked in the selected position whereby to determine the radius of curvature of the line of cut in use of the guide.

The guide body is preferably adapted to receive a router and has a rectilinear channel housing a slide member on which are marked a plurality of graduations which can be referred to the relevant side of the cutting edge of the cutting tool, and the means for engaging a workpiece may comprise a pointed element carried on a subsidiary slide member which is displaceable with respect to the main slide and carries an index marker referable against the graduations on the main slide to determine the relative positions of the cutter tool in the workpiece engagement means.

Conveniently, the channels have an undercut inclined or T-section side wall (preferably a dovetail cross section) so that the clamping force exerted when the relatively movable members are fixed in their selected positions does not disturb them or tend to displace them through the open face of the channel. The clamping means for retaining the slides in the selected positions may include a resiliently closable lever arrangement in an over-centre or toggle linkage configuration so that the clamping and release movements can be effected quickly and easily once selected adjustment has been reached.

Two embodiments of the present invention will now be more particularly described, by way of example, with

Figure 1 is a perspective view of a first embodiment of the invention, partly cut away to illustrate the internal components of the device more clearly;

Figure 2 is a longitudinal section taken on the lines II-II of Figure 1;

Figure 3 is a cross section taken on the line III-III of Figure 2; and

Figure 4 is a perspective view of a part of a second embodiment of the invention.

Referring first to Figures 1 to 3 of the drawings, the first embodiment of the present invention, generally indicated with the reference numeral 11, comprises a main guide body 12 possibly in the form of a transparent, preferably plastics, rectilinear plate-like body having an upper face 13 and a lower face 14 with a longitudinally extending guide channel 15 in the face 14. The side walls of the channel 15 are undercut so that it has an approximately dove tail configuration as seen in cross section, as can be particularly observed from Figure 3.

Close to one end of the body 12 is a through hole 16 having a generally D-shape with inclined faces 16a to receive a router guide bush, indicated schematically with the reference numeral 17.

Within the channel 15 in the under face 14 of the guide body 12 is housed a longitudinal main slide 18 having a shape complementary to that of the channel 15. In one lower edge of the main slide 18 there is formed a rebate 19 having a corresponding dove tail cross section, again, as can be seen in Figure 3, and within this

rebate is housed a dove tail section secondary slide member 20 having a transversely projecting spike 21.

In one edge 22 of the guide body 12 is formed a lateral recess housing a toggle lever assembly generally indicated 24. The recess opens into the rectilinear channel 15 and a pressure member 26 of the over-centre toggle mechanism 24 can contact a side face 27 of the main slide 18 when the toggle mechanism 24 is closed. Such closure presses the main slide 18 against the opposite side wall 15A of the rectilinear channel 15 thereby locking it frictionally in position. The same action also locks the subsidiary slide 20 within the channel defined by the side wall 15A and the rebate 19.

The main body 12 is transparent and the main slide 18 has a plurality of graduations 28 which are visible through the main body 12. The subsidiary body 20 has a reference index 29 which is also visible through the main body 12 and the main slide 18 (which latter is also transparent).

Finally, the main slide 18 has a reference abutment member 30 which can be pivoted between an operative position as shown in Figure 2 and an out-of-use position as in Figure 1, the function of which is to allow the main slide 18 to be set along the channel 15 in the guide body 12 in dependence on the precise diameter of the cutter of the router and its position within the router bush 17 in order to be able to accommodate different cutter tools and different routers.

In use of the guide tool of the invention, therefore,

the guide bush 17 and a cutter is fitted to the router and this is then inverted. The guide tool is placed bottom upwards over the guide bush and the toggle locking mechanism 24 released to allow the main slide 18 and subsidiary slide 20 to move along their respective channels. The cutter is then turned until one of the cutting edges is on the centre line of the guide body 12 pointing away from the graduated scale 28. The abutment member 30 is then moved from its rest position to its operative position and the scale datum is then effectively set by sliding the main slide which carries the abutment 30 until this latter is just touching the appropriate cutting edge; this may be the edge nearest the adjacent end of the tool body 12 or the opposite edge depending on whether the router is about to be used to cut circular holes or circular bodies. The main slide 18 is then held in position whilst the subsidiary slide 20 carrying engagement means in this embodiment in the form of a pin 21 is moved until the reference index 29 is placed against the appropriate part of the graduated scale 28 to give a reading of the required diameter of the circular hole or the circular body to be cut. The lever 24 is then moved to its closed position so that the pressure face 26 clamps the main slide 18 and subsidiary slide 20 against the side face 15A of the rectilinear channel 15 clamping these securely in the selected positions. The guide body 12 is then positioned with the pin 21 in contact with the workpiece at the required centre of the circular hole or circular body to be cut and pressed in until the lower face 14 of the guide body 12 lies over and in contact with the surface of the workpiece to be cut. The router in the guide bush 17 is then energised and moved in a circle

with the guide body 12 acting as a radial crank arm, the router being free to rotate with respect to this by means of the guide bush 17 so that the orientation of the router with respect to the operator remains the same throughout the circular movement of the cutter.

Because the router itself holds the guide 12 against the workpiece the arrangement can be used at any angle, even upside down.

During use the router is held so that its guide bush 17 is pressed radially outwardly against the inclined surfaces 16a as the tool is turned about the pivot formed by the pin 21.

Means (not shown) may be provided to hold the guide bush 17 steady to prevent variations in the radius of cutting. Likewise, in other embodiments, not shown, an extension member may be provided to allow larger circles to be cut. Further, epicentric datum devices may be provided to permit curves other than circular curves to be cut, for example, epicyclic or hypocyclic curves.

For some applications it may be found that the radially inward force exerted by the cutter blade is too great for the operator to be able readily to maintain contact between the bearing bush 17 and the inclined faces 16a and the router starts to creep radially inwardly slightly. The embodiment of Figure 4 overcomes this problem.

Figure 4 illustrates the end of the tool for receiving the router, the remainder of the tool being substan-

tially identical with the embodiment illustrated in Figures 1 and 3. In this embodiment the irregularly shaped hole 16 in the main body is replaced by a circular hole 35 of radius d having a large annular rebate 36 formed in the upper face through a part of the thickness of the main body 12, in this embodiment the depth of the annular rebate 36 is approximately one quarter of the thickness of the main body 12, but a different depth, for example a third, a half or even more may be adopted if required. The diameter of the annular recess 36 is D which is greater than the diameter d of the aperture 35.

Received within the recess 36 is an annular bush retainer element 37 having an outer diameter D matching that of the recess 36 and a central hole 38 of diameter b which is small than the diameter d of the aperture 35. The tool 11 is provided with a plurality of such annular elements all of the same outer diameter D and each having a different internal diameter b matching that of a respective bearing bush 17 to be found on a commercially available router. Whatever router is used on the tool 11, therefore, it will be possible to select an annular element 37 to fit into the recess 36 and present a circular central opening 38 exactly matching that of the axial projection of the bearing bush 17 so that this is held securely without play, but as a sliding (or rather rotating) fit within the opening 38. In this embodiment there is no tendency for the router to move radially even if the cutter blade should hit an uneven part of the workpiece material and exert a greater radial force on the tool.

There may be provided means for interconnecting the rim of the annular member 37 into the recess 36. For example, the periphery of the recess 36 may be undercut to act as a detent to receive the rim of the annular member 37 or radial projections therefrom. Such an arrangement ensures that the annular member 37 is retained securely without risk of it becoming dislodged either during use or during setting of the radius when the slide member 18 is displaced longitudinally with respect to the body 12. The range of sizes of the central aperture 38 in the annular member 37 naturally has an upper limit at the diameter of the central hole 35 in the body 12, namely the diameter d. Providing b<d the diameter b may be of any value to receive a router guide bush 17 of appropriate size.

CLAIMS

1. A guide for a cutting tool such as a router or the like, comprising a guide body having means for receiving a fixed part of the cutting tool in a manner such as to allow relative rotation between the tool and the guide body, and engagement means for engaging a workpiece to allow the guide body to turn thereabout carrying the tool in a path centred on the point of engagement between the guide body and the workpiece.

2. A guide as claimed in Claim 1, in which the guide body has an opening for receiving a guide bush of a router or a guide bush location member

3. A guide as claimed in Claim 1 or Claim 2, in which there are provided means for adjusting the relative separation of the said workpiece engagement means and the tool-receiving means.

4. A guide as claimed in Claim 3, in which the means for adjusting the relative separation comprise a channel in the said guide tool body, a slide member displaceable along the channel and means for fixing the slide member in a selected position along the channel.

5. A guide as claimed in Claim 4, in which the slide member has a plurality of graduated markings thereon and means for determining a reference datum which can be brought into a predetermined position with respect to a cutter of a tool housed in the opening in the guide body.

6. A guide as claimed in Claim 5, in which the reference datum is constituted by an abutment member displaceable between an operative position where it can be brought into contact with the cutter of the said tool and an inoperative position out of the line of movement of the displaceable slide member.

7. A guide as claimed in any preceding Claim, in which the means for engaging a workpiece is carried on a displaceable member which can be moved with respect to the said slide member and locked in the selected position whereby to determine the radius of curvature of the cutter in use.

8. A guide as claimed in any preceding Claim in which the guide body is adapted to receive a router and has a rectilinear channel housing a slide member in which are marked a plurality of graduations which can be referred against a cooperating index on the guide body, and the means for engaging a workpiece comprise a pointed element carried on a subsidiary slide member which is displaceable with respect to the main slide and carries an index marker referrable against the graduations on the main slide to determine the relative positions of the cutter tool and the workpiece engagement means.

9. A guide as claimed in any of Claims 4 to 8, in which the channels have undercut inclined side walls such that clamping force tends to retain them against removal through the open face of the channel.

10. A guide as claimed in any of Claims 4 to 9, in which the clamping means for retaining the slides in

uration.

11. A guide as claimed in any of Claims 2 to 10, in which the router guide bush retaining member is an annular insert element adapted to be received in an annular recess in a face of the said guide body.

12. A guide as claimed in Claim 11, in which there are provided a plurality of such router guide bush retaining members each having the same outer diameter to fit the said guide body recess and each having an internal diameter different from the others to receive a router bush of a different size.

13. A guide as claimed in Claim 11 or Claim 12, in which there are provided detent means for retaining the or a router guide bush retaining member in position in the said recess.

14. A guide for a cutting tool, substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

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